

1. Title Page

Title: Improving Safety of Transitions to Skilled Nursing Care Using Video Conferencing
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2. Structured Abstract

Purpose: The purpose of this project was to replicate the ECHO-CT videoconference program, which held weekly discussions between hospitalists and post-acute care providers about patients discharged from the hospital to a skilled nursing facility (SNF) during the preceding week, in a teaching hospital and community-based hospital and their networks of SNFs and to examine the effects of the intervention on length of stay, cost, readmissions, and adverse clinical events.

Scope: We studied a total of 10,708 fee-for-service Medicare beneficiaries discharged from study hospitals to SNFs; 2498 were discharged from small community hospitals, and 8210 were discharged from large teaching hospitals to a total of 184 SNFs.

Methods: We conducted a prospective cohort study comparing changes in patient outcomes of hospital-SNF dyads that participated in the ECHO-CT program to a sample of nonparticipating dyads.

Results: There was no intervention effect on readmissions, 30-day Medicare costs, or SNF length of stay. In a sensitivity analysis of patients who received the full intervention, there was a nonsignificant trend ($P < .07$) toward improvement in re-hospitalization rates in the teaching hospital. Medical errors were identified during 14.7% of ECHO-CT discussions; most were medication related and were more likely for discharges from surgical or emergency departments but less likely for morning discharges.

Key Words: transitions of care, telehealth, quality improvement, skilled nursing facilities

3. Purpose: The objectives of the study were as follows:

- 1) To replicate the ECHO-CT program on a larger scale in a tertiary and community-based hospital and their networks of skilled nursing facilities (SNFs) in Massachusetts.
- 2) To test the hypothesis that SNFs participating in the ECHO-CT intervention will demonstrate a) fewer 30-day hospital readmissions, b) lower 30-day healthcare costs, and c) shorter lengths of stay in the SNF for their Medicare patients transferred from participating hospitals compared with Medicare patients in a large group of comparison facilities in a facility-matched design. The comparison group included SNFs receiving patients from New England metropolitan area hospitals similar to the tertiary and community-based hospitals participating in the ECHO-CT intervention. The primary outcome was 30-day readmissions. d) We also aimed to identify adverse outcomes potentially associated with poor care transitions among patients from participating hospitals and SNFs.
- 3) To assess operational challenges and stakeholder satisfaction with the ECHO-CT program and use this information to develop the protocols and tools necessary for future dissemination of ECHO-CT.

4. Scope

Discharge from hospitals to post-acute care facilities, including skilled nursing facilities (SNFs), represents a challenging and potentially dangerous care transition because of gaps in communication, changes in care teams, different medication formularies, and misaligned treatment plans. In response to this healthcare challenge, we developed a novel telehealth videoconference program, called ECHO-Care Transitions (ECHO-CT), which was modeled after the ECHO (Extension for Community Healthcare Outcomes) teleconferencing framework. We

then implemented this program at an academic and community hospital. We implemented the ECHO-CT in one small community hospital and in seven associated SNFs as well as in one large teaching hospital and 11 associated SNFs between March 23, 2019, and February 25, 2021 (pausing the program for 2 months in early 2020 due to the initial COVID outbreak). We studied 184 hospital-SNF dyads in the analysis.

5. Methods

Aims 2a, 2b, 2c:

We used 2018 inpatient and SNF fee-for-service (FFS) Medicare claims from all hospitals in Massachusetts, Connecticut, Rhode Island, Vermont, and New Hampshire and the SNFs to which they discharged, as well as a measure of hospital teaching status from the 2019 Open Payment List of Teaching Hospitals made publicly available by CMS, to select the set of eligible control hospital-SNF dyads. Control hospitals were matched to intervention hospitals by teaching status (academic or community based) and size (measured as +/- 20% of the intervention hospitals' annual volume of Medicare discharges to SNFs). Once control hospitals were selected, affiliated SNFs were chosen. Similar to the strategy used to select intervention SNFs, we chose control SNFs whose discharge volume from the hospital to that particular SNF was in the middle third of all SNFs receiving patients from that hospital.

We selected all Medicare FFS beneficiaries ages 65 and older who were discharged from a study hospital (from either an inpatient hospital stay or an outpatient observation stay) and admitted to an affiliated SNF within the following study periods: pre-intervention: January 23, 2018 – January 23, 2019; intervention pre-COVID: March 23, 2019 – March 28, 2020; and Intervention during COVID: May 23, 2020 – February 25, 2021. Due to the COVID-19 pandemic and the redeployment of facilities and staff to manage the outbreak, there was a 2-month pause in the program between March 29, 2020, and May 22, 2020. The primary outcome was 30-day rehospitalization. We also evaluated length of SNF stay (up to 100 days) and total SNF costs for a subset of patients who were not hospitalized and did not die within 30 days. To test the impact of the ECHO-CT program on outcomes, we conducted difference-in-differences (DID) analyses, comparing patient outcomes from a pre-intervention period to an intervention period for hospital-SNF dyads participating in the ECHO-CT program (the “treatment” group) and nonparticipating SNFs (the “control” group). We performed separate analyses for the large teaching hospitals and the small community hospitals.

We used adjusted generalized logistic regression with robust standard errors clustered on SNFs to estimate odds ratios, 95% confidence intervals, and adjusted least square means for the dichotomous 30-day rehospitalization outcome. For length of stay and cost outcomes, we used adjusted quantile regression clustering on SNFs to estimate median length of stay and median costs.

Study limitations included 1) interruption by the COVID pandemic, which greatly impacted processes of care and patient populations, and 2) the inability to randomly assign facilities or patients to treatment and control groups. Therefore, in addition to considering the location (state), size (# of discharges to SNFs), and hospital type (large teaching vs. small community), we also controlled for a number of SNF and patient level characteristics, and we performed separate analyses of outcomes before the pandemic and while it was still occurring.

Aim 2d:

Patients were discussed during the ECHO-CT conference, and any medical care discrepancies or concerns from the care teams were recorded as a transitional care event (TCE). Two physicians independently reviewed each TCE to determine if a medical error had occurred. If there was disagreement, this was discussed with additional input from other team members in attempt to reach consensus. Patient demographic and hospitalization characteristics were obtained from the medical record. Bivariate and multivariate models were conducted separately for each site (teaching and community hospital sites) and then combined in a third model to identify factors that conferred a higher risk for experiencing a medical error.

6. Results

Aims 2a, 2b, 2c:

Findings and Outcomes: There were 10,708 FFS Medicare beneficiaries discharged from study hospitals to study SNFs during the baseline or intervention periods; 2498 were discharged from small community hospitals, and 8210 were discharged from large teaching hospitals, to a total of 184 SNFs. There were no significant differences in pre- and post-30-day hospital readmission rates in hospital-SNF dyads that participated in the ECHO-CT program compared with hospital-SNF dyads that did not. There were similar null findings for the SNF length of stay and for 30-day SNF costs, with small, nonsignificant increases in lengths of stay and costs for both the community hospital and the teaching hospital. Although we have previously shown that ECHO-CT had a beneficial impact on readmission rate, costs of care, and SNF length of stay, we were unable to replicate these results in the current study.

In a sensitivity analysis examining only patients who received the full intervention, we did see a nonsignificant trend ($P < .07$) toward improvement in re-hospitalization rates in the teaching hospital, suggesting that there may be a direct benefit to individuals. However, there was no apparent spillover effect to other patients in the same dyad who did not receive the full intervention.

Discussion and Conclusions: Several factors may have contributed to our null outcomes. Lack of adherence to the model may have resulted in less benefit than has been observed with other ECHO interventions. Additionally, SNF participation was not as robust as we had hoped, with a large number of patients not discussed due to canceled sessions or no-shows to the session. As the success of the program was dependent on the engagement of both the SNF and hospital-based teams, lack of participation and engagement may have affected our outcomes.

Our study was also interrupted by the COVID-19 pandemic, which decreased our enrollment numbers, making it more difficult to detect a difference if one exists and potentially blunting the impact of the intervention, as staff were stretched thin and potentially unable to engage as meaningfully as they would have otherwise. Additionally, the potential impact the pandemic had on our results necessitated evaluating the program in three different time periods, decreasing our power to detect a difference, if one existed. Of note, although we implemented the intervention in all patients discharged from our hospitals to participating SNFs, this study only evaluated outcomes in patients with FFS claims, so we could not assess its impact in other populations who received the intervention.

Aim 2d:

Findings and Outcomes: In a separate study to examine the potential impact of ECHO-CT on clinical outcomes, we studied errors that were uncovered and discussed during the video conferences. A total of 1432 discussions occurred for 1326 patients. In 435 discussions, an issue was identified that required additional discussion (known as a transition of care event or TCE). These were reviewed, adjudicated, and categorized by a geriatrician and hospitalist who reached consensus about whether a particular event was a medical error. The majority of TCEs were related to medications. In 14.7% of all discussions, a medical error was identified. We found that errors were more likely to occur for patients discharged from surgical services or the emergency department (ED; compared with discharge from medical services) and were less likely to occur for patients who were discharged in the morning.

Discussion and Conclusions: This study shows that a number of errors may be detected in the post-discharge period and that the ECHO-CT program provides a mechanism for identifying and mitigating these events. Furthermore, it suggests that the discharging service and time of day may be associated with risk of error in the discharge period, thereby suggesting potential areas of focus for future interventions.

Aim 3:

We evaluated operational challenges, sent satisfaction surveys to our intervention SNF providers, and used this information to continuously improve the ECHO-CT sessions and develop a toolkit describing the protocols and tools necessary for future dissemination of the ECHO-CT program. The toolkit is widely available on the Beth Israel Deaconess Medical Center website (see the URL below) and has been shared with AHRQ.

7. List of Publications and Products

Gonzalez M, Junge-Mahan J, Lipsitz L, Moore A. "ECHO-CT: An Interdisciplinary Videoconference Model for Identifying Potential Post-Discharge Transition of Care Events." *J. Hosp. Med.* 2021 Feb;16(2):93-96. DOI: 10.12788/jhm.3523

Moore A, Lipsitz L. "ECHO'S Echo: Overcoming modern healthcare operational challenges with provider-to-provider video communication." *J. Hosp. Adm.* 2020 May 12. DOI: 10.5430/jha.v9n2p48.

Junge-Maughan L, Moore A, Lipsitz L. Key strategies for improving transitions of care collaboration: lessons from the ECHO-care transitions program. *J. Interprof. Care.* 2020 Aug 18; 1-4. DOI: 10.1080/13561820.2020.1798900

Project ECHO Care-Transitions Program Toolkit. 2019. <https://www.bidmc.org/-/media/files/beth-israel-org/research/research-by-department/medicine/gerontology/echo-care/bidmc-echo-ct-toolkit-032521.pdf>

Two papers describing the results above have been submitted for publication:

An interdisciplinary videoconference model for identifying potential adverse transition of care events following hospital discharge to post-acute care

Evan Beiter, Akshay Shanbhag, MD, Lauren Junge-Maughan, MPH, Kristen Knoph, PharmD, Alyssa B. Dufour, PhD, Lewis Lipsitz, MD, Amber Moore, MD, MPH

An interdisciplinary videoconference to improve transitions of care and reduce readmission, cost, and post-acute length of stay in a teaching and community hospital

Amber Moore, MD, MPH, Julie C. Lima, MPH, PhD, Sweta Patel, BDS, MPH, Lauren Junge-Maughan, MPH, Alyssa B. Dufour, PhD, Lewis Lipsitz, MD